

## SEQUENCE LISTING

## RECEIVED

SER 19 7001

TECH CENTER 1600 2900

-110> Ayyavoo, Velpandi Patel, Mamata Kieber-Emmons, Thomas Weiner, David B. Mahalingam, Sundaramy

 $\pm 120\%$  Functional Fragments of HIV-1 VPR Protein and Methods of Using the Same

#130> UPN-4023

-1405 09/485,421

· 141 = 2000-10-05

-150. 60/085,754

\*151 · 1997-05-14

- 160 18

<1700 PatertIn Ver. 2.1

4210: 1

4211: 96

<2120 PRT

32133 Artificial Sequence

- 220

+223 > Description of Artificial Sequence: Novel Sequence

- 400> 1

Met Glu Glr. Ala Pro Glu Asp Gln Gly Pro Gln Arg Glu Tyr Pro Asn 1 5 15

Asp Trp Thr Leu Glu Leu Glu Glu Leu Lys Asn Glu Ala Val Arg 20 25 30

His Phe Prc Arg Ile Trp Leu His Ser Leu Gly Gln His Ile Tyr Glu 35 40 45

Thr Tyr Gly Asp Thr Trp Thr Gly Val Glu Ala Leu Ile Arg Ile Leu 50 60

Glin Glin Leu Leu Phe Ile His Phe Arg Ile Gly Cys Arg His Ser Arg 6.5 70 75 80

lle Gly Ile Ile Gl<br/>n Gln Arg Arg Thr Arg As<br/>n Gly Ala Ser Lys Ser 85 90 95

<sup>- 210&</sup>gt; 2

<sup>+ 2115 191</sup> 

<sup>- 2125</sup> FRT

<sup>+313&</sup>gt; Artificial Sequence

. 220 -

+ 223 \* Description of Artificial Sequence: Novel Sequence

-400 - 2

Met Glu Glu Arg Pro Pro Glu Asn Glu Gly Pro Gln Arg Glu Pro Trp

Asp Glu Trp Val Val Glu Val Leu Glu Glu Leu Lys Glu Glu Ala Leu 20 25 30

Lys His Phe Asp Pro Arg Leu Leu Thr Ala Leu Gly Asn His Ile Tyr 35 40 45

Asn Arg His Gly Asp Thr Leu Glu Gly Ala Gly Glu Leu Ile Arg Ile 50 55 60

Leu Gln Arg Ala Leu Phe Met His Phe Arg Gly Gly Cys Ile His Ser -85 70 75 80

Arg Ile Gly Gln Pro Gly Gly Gly Asr. Pro Leu Ser Ala Ile Pro Pro 85 90 95

Ser Arg Ser Met Leu 100

+210:-3

 $+0.11 \cdot -111$ 

+212> PRT

+ 213> Artificial Sequence

4.2205

4223 Description of Artificial Sequence: Novel Sequence

-400> 3

Met Thr Asn Pro Arg Glu Thr Ile Pro Pro Gly Asn Ser Gly Glu Glu

Thr Ile Glu Glu Ala Phe Asp Trp Leu Asp Arg Thr Val Glu Ala Ile 20 25 30

Amn Arg Glu Ala Val Amn His Leu Pro Arg Glu Leu Ile Phe Gln Val 35 40 45

Trp Gln Arg Ser Trp Arg Tyr Trp His Asp Glu Gln Gly Met Ser Arg
50 55 60

Ser Tyr Thr Lys Tyr Arg Tyr Leu Cys Leu Met Gln Lys Ala Val Phe

Met His Phe Lys Lys Gly Dys Thr Dys Ard Gly Glu Gly His Gly Pro 85 90 95

Cly Gly Trp Arg Ser Gly Pro Pro Pro Pro Pro Pro Pro Gly Leu 100 105 110 +1.109 - 4A. 117 96 - 2125 PRT +213 Artificial Sequence -2220s enal: Description of Artificial Sequence: Novel Sequence -400 > 4Met Glu Gln Ala Pro Glu Asp Gln Gly Pro Gln Arg Glu Pro Tyr Asn Amp Trp Thr Leu Glu Leu Leu Glu Glu Leu Lys Asn Glu Ala Val Arg His The Fro Arg Ile Trp Leu His Ser Leu Gly Gln His Ile Tyr Glu Thr Tyr Gly Asp Thr Trp Thr Gly Val Glu Ala Leu Ile Arg Ile Leu 5.5 Gln Gln Leu Leu Phe Ile His Phe Arg Ile Gly Cys Arg His Ser Arg 65 The Gly The The Gln His Arg Arg Thr Arg Ash Gly Ala Ser Lys Ser 8 6 9:1 42100 - 54211 96 K212° PRT <213 Artificial Sequence <2220% <223> Description of Artificial Sequence: Novel Sequence <400% 5 Met Glu Gln Ala Pro Glu Asp Gln Gly Pro Gln Arg Glu Pro Tyr Asn Asp Trp Thr Leu Pro Leu Leu Pro Glu Leu Lys Asn Glu Ala Val Arg 20 His Phe Pro Arg Tle Trp Leu His Ser Leu Gly Gln His Ile Tyr Glu Thr Tyr Gly Asp Thr Trp Thr Gly Val Glu Ala Leu Ile Arg Ile Leu 57) 55 Gln Gln Leu Leu Phe Ile His Phe Arg Ile Gly Cys Arg His Ser Arg

The Gly Ile Ile Gln His Arg Arg Thr Arg Asn Gly Ala Ser Lys Ser

-211 · 96 ≈210° PRT <213 Artificial Sequence</p> ·. 2201 4223 - Description of Artificial Sequence: Novel Sequence 400 6 Met Glu Gln Ala Pro Glu Asp Gln Gly Pro Gln Arg Glu Pro Tyr Asn Asp Trp Thr Ala Gl. Ala Ala Glu Glu Ala Lys Asn Glu Ala Val Arg His The Pro Arg Ile Trp Leu His Ser Leu Gly Gln His Ile Tyr Glu Thr Tyr Gly Asp Thr Trp Thr Gly Val Glu Ala Leu Ile Arg Ile Leu Gln Gln Leu Leu Phe Ile His Phe Arg Ile Gly Cys Arg His Ser Arg Ile Gly Ile Ile Glr. His Arg Arg Thr Arg Asm. Gly Ala Ser Lys Ser <2105 7 <211- 96 4212 · PRT 4213 · Artificial Sequence <2205 <223 - Description of Artificial Sequence: Novel Sequence</p> Met Glu Glr Ala Pro Glu Asp Gln Gly Pro Glr Arg Glu Pro Tyr Asn 1.0 Asp Trp Thr Leu Glu Leu Leu Glu Glu Leu Lys Asn Glu Ser Val Arg His Phe Pro Arg Ile Trp Leu His Ser Leu Gly Gln His Ile Tyr Glu Thr Tyr Gly Asp Thr Trp Thr Gly Val Glu Ala Leu Ile Arg Ile Leu Gln Gln Leu Leu Phe Ile His Phe Arg Ile Gly Cys Arg His Ser Arg 65 Ile Gly Ile Ile Gln His Arg Arg Thr Arg Asn Gly Ala Ser Lys Ser - 11 1 h - 2 - 211 - FG

-012> PRT

Antificial Sequence

- 1203

+223> Description of Artificial Sequence: Novel Sequence

- 400 > 8

Met Glu Gln Ala Pro Glu Asp Gln Gly Pro Gln Arg Glu Pro Tyr Asn 1 5 15

Asp Trp Thr Leu Glu Leu Leu Glu Glu Leu Lys Ash Glu Leu Val Arg 20 25 30

His Phe Pro Arg Ile Trp Leu His Ser Leu Gly 3ln His Ile Tyr Glu 35 40 45

Thr Tyr Gly Asp Thr Trp Thr Gly Val Glu Ala Leu Ile Arg Ile Leu 50 55 60

Gln Gln Leu Leu Phe Ile His Phe Arg Ile Gly Jys Arg His Ser Arg 65 70 75 80

Ile Gly Ile Ile Glr. His Arg Arg Thr Arg Asn Gly Ala Ser Lys Ser 85 90 95

+210> 9

· 211> 96

~212> PRT

-213> Artificial Sequence

- 220b

+ 023> Description of Artificial Sequence: Novel Sequence

-:400> G

Met Glu Gln Ala Pro Glu Asp Gln Gly Pro Gln Arg Glu Pro Tyr Asn 1 5 10 15

Asp Trp Thr Leu Glu Leu Leu Glu Glu Leu Lys Asn Glu Ala Val Arg 20 25 30

His Fhe Pro Arg Ile Trp Leu His Ser Leu Gly Gln His Ile Tyr Glu 35 40 45

Thr Tyr Gly Asp Thr Trp Thr Gly Val Glu Pro Leu Ile Arg Ile Leu 50 55 60

Gln Gln Leu Leu Phe Ile His Phe Arg Ile Gly Gys Arg His Ser Arg 70 75

 Ile Gly Ile Ile Gl<br/>n His Arg Arg Thr Arg As<br/>n Gly Ala Ser Lys Ser  $90\,$  95

· 2110 · 10

-3115 96

- 2125 PRT

Alli Artificial Sequence . 320 -HBBB - Description of Artificial Sequence: Novel Sequence 400 - 10 Met Glu Gln Ala Pro Glu Asp Gln Gly Pro Glr Arg Glu Pro Tyr Asn Asp Trp Thr Leu Glu Leu Leu Glu Glu Leu Lys Asn Glu Ala Val Arg His Phe Pro Arg Ile Trp Leu His Ser Leu Gly Gln His Ile Tyr Glu 4.0 The Tyr Gly Asp The Trp The Gly Val Glu Ala Leu Ile Arg Ser Leu 5.5 Gln Gln Leu Leu Phe Ile His Phe Arg Ile Gly Cys Arg His Ser Arg The Gly The The Glm His Arg Arg Thr Arg Asm Gly Ala Ser Lys Ser  $<210 \cdot 11$ 4211 - 96 +212 + PRT 2213 Artificial Sequence  $c \subseteq \subseteq (0.7)$ <223 Description of Artificial Sequence: Novel Sequence</p> Met Glu Gln Ala Pro Glu Asp Gln Gly Pro Gln Arg Glu Pro Tyr Asn 10 Asp Trp Thr Leu Glu Leu Leu Glu Glu Leu Lys Asn Glu Ala Val Arq His Phe Pro Arg Ile Trp Leu His Ser Leu Gly Gln His Ile Tyr Glu Thr Tyr Gly Asp Thr Trp Thr Gly Val Glu Ala Leu Ile Arg Ile Leu Gln Gln Ser Leu Phe Ile His Phe Arg Ile Gly Cys Arg His Ser Arg , E Ile Gly Ile Ile Gln His Arg Arg Thr Arg Asn Gly Ala Ser Lys Ser 90

 $<sup>+0.10 \</sup>times 40$ 

<sup>· 1115 96</sup> 

<sup>+1.12 +</sup> FFT

<sup>+ 213 +</sup> Artificial Sequence

. Mil.

+ 223> Description of Artificial Sequence: Novel Sequence

- 4 alto 12

Met Glu Gl<br/>n Ala Pro Glu Asp Gl<br/>n Gly Pro Gl<br/>n Arg Glu Pro Tyr As<br/>n 10  $^{\circ}$  15

Asp Trp Thr Leu Glu Leu Glu Glu Leu Lys Asn Glu Ala Val Arg 20 25 30

His Fhe Pro Arg Ile Trp Leu His Ser Leu Gly Gln His Ile Tyr Glu 35 40 45

Thr Tyr Gly Asp Thr Trp Thr Gly Mal Glu Ala Leu Ile Arg Ile Leu 50 55

Gln Gln Leu Ser Phe Ile His Phe Arg Ile Gly Cys Arg His Ser Arg 65 70 75 80

Ile Gly Ile Ile Gln His Arg Arg Thr Arg Asn Gly Ala Ser Lys Ser 85 90 95

×210> 13

<211> 96

- 212> PRT

+213 Artificial Sequence

0.5

+323> Description of Artificial Sequence: Novel Sequence

+ 4005 13

Met Glu Gln Ala Pro Glu Asp Gln Gly Pro Gln Arg Glu Pro Tyr Asn 1 5 10 15

Asp Trp Thr Leu Glu Leu Elu Glu Leu Lys Asn Glu Ala Val Arg 20 25 30

His Phe Pro Arg Ile Trp Leu His Ser Leu Gly Gln His Ile Tyr Glu 35 40 45

Thr Tyr Gly Asp Thr Trp Thr Gly 'al Glu Ala Leu Ile Arg Ile Leu 50 55 60

Gln Gln Leu Leu Phe Ile Cys Phe Arg Ile Gly Cys Arg His Ser Arg -65 75 80

He Gl $\gamma$  Ile Ile Gln His Arg Arg Thr Arg Asn Gly Ala Ser L $\gamma$ s Ser 85 90 95

· 1.10> 14

· 2115 96

HILLS FFT

...130 Artificial Sequence

-.2200 → +2235 Description of Artificial Sequence: Novel Sequence  $+4\cdot m+14$ Met Glu Gln Ala Pro Glu Asp Gln Gly Pro Gln Arg Glu Pro Tyr Asn 10 1.5 Asp Trp Thr Leu Glu Leu Leu Glu Glu Leu Lys Asn Glu Ala Val Arg His The Pro Arg Ile Trp Leu His Ser Leu Gly Gln His Ile Tyr Glu The Tyr Gly Asp The Trp The Gly Val Glu Ala Leu Ile Arg Ile Leu 5.5 Gln Gln Leu Leu Phe Ile Tyr Phe Arg Ile Gly Cys Arg His Ser Arg Ile Gly Ile Ile Gln His Arg Arg Thr Arg Asn Gly Ala Ser Lys Ser F210: 15 4211- 96 4212 PRT <213 Artificial Sequence < 220 ps 3223 Description of Artificial Sequence: Novel Sequence Met Glu Gln Ala Pro Glu Asp Gln Gly Pro Gln Arg Glu Pro Tyr Asn 1.0 Asp Trp Thr Leu Glu Leu Leu Glu Glu Leu Lys Asn Glu Ala Val Arg His Phe Pro Arg Ile Trp Leu His Ser Leu Gly Gln His Ile Tyr Glu Thr Tyr Gly Asp Thr Trp Thr Gly Val Glu Ala Leu Ile Arg Ile Leu Gln Gln Leu Leu Phe Ile His Phe Arg Ile Ala Cys Arg His Ser Arg ř. 5 Ile Gly Ile Ile Gln His Arg Arg Thr Arg Asn Gly Ala Ser Lys Ser 30 F2140-16 - 211-- 96 - 212 - FRT \*213 Artificial Sequence

27.71

+ 223 - Description of Artificial Sequence: Novel Sequence -400-16 Met Glu Gln Ala Pro Glu Asp Gln Gly Pro Gln Arg Glu Pro Tyr Asn Asp Trp Thr Leu Glu Leu Leu Glu Glu Leu Lys Asn Glu Ala Val Arg His Phe Pro Arg Ile Trp Leu His Ser Leu Gly Gln His Ile Tyr Glu Thr Tyr Gly Asp Thr Trp Thr Gly Val Glu Ala Leu Ile Arg Ile Leu Gln Gln Leu Leu Phe Ile His Phe Arg Ile Gly Ser Arg His Ser Arg 7(: The Gly The The Glr. His Arg Arg Thr Arg Ash Gly Ala Ser Lys Ser +210> 17 + 2115 78 -2125 FRT <313> Artificial Sequence +323% Description of Artificial Sequence: Novel Sequence  $\pm 400 \simeq 17$ Met Glu Gln Ala Pro Glu Asp Gln Gly Pro Gln Arg Glu Pro Tyr Asn Asp Trp Thr Leu Glu Leu Leu Glu Glu Leu Lys Asn Glu Ala Val Arg 20 His Phe Pro Arg Ile Trp Leu His Ser Leu Gly Gln His Ile Tyr Glu Thr Tyr Gly Asp Ile Trp Ile Gly Val Glu Ala Leu Ile Arg Ile Leu Gln Gln Leu Leu Phe Ile His Phe Gln Asn Trp Mal Ser Thr 7.0 - 210: 19 -211-96 -3127 PRT 213 Artificial Sequence - 323 - Description of Artificial Sequence: Novel Sequence - 4005 18 Met Glu Gln Ala Pro Glu Asp Gln Gly Pro Gln Arg Glu Tyr Pro Asn His Phe Pro Arg Ile Trp Leu His Ser Leu Gly Gln His Ile Tyr Glu 35 40 45

The Tyr Gly Asp Thr Trp Thr Gly Val Glu Ala Leu Ile Arg Ile Leu 50 55 60

Gln Gln Leu Leu Phe Ile His Phe Arg Ile Gly Cys Arg His Ser Arg 65 70 75 80

Ile Gly Ile Ile Gln Gln Arg Arg Thr Arg Asn Gly Ala Ser Lys Ser 85 90 95